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CITATION:

TAS HIRO, Yasuko ...[et al.]. Habitat Changes and Decreases in the Bonobo Population in Wamba, Democratic Republic of the Congo. African Study Monographs 2007, 28(2): 99-106

ISSUE DATE:

2007-07

URL:

<https://doi.org/10.14989/68257>

RIGHT:

HABITAT CHANGES AND DECREASES IN THE BONOBO POPULATION IN WAMBA, DEMOCRATIC REPUBLIC OF THE CONGO

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ABSTRACT We studied the influence of political turmoil on the population of bonobos (*Pan paniscus*) in Wamba Forest, Democratic Republic of the Congo. Although six groups of bonobos inhabited Wamba Forest in 1995, we confirmed only three groups in 2005. The home ranges of each group shifted markedly after the civil wars. The poaching of bonobos using guns and snares may have been a cause of the decrease in the number of bonobos and of the change in their home ranges, though we could not confirm whether villagers poached bonobos. We compared vegetation before and after the civil wars with Landsat images. Villagers have been logging the primary forest to create fields, and the secondary forest has expanded. Habitat changes also contributed to the decline in the bonobo population around the village. Historically, eating bonobo has been taboo for the people of Wamba, but it is possible that the frequent movement of people between the village and towns will introduce the custom of eating bonobo to Wamba Village. The political turmoil has had a remarkable effect on not only the lives of the people, but also the status of the bonobo population in Democratic Republic of the Congo.

Key Words: Bonobo; *Pan paniscus*; Wamba Forest; Habitat changes; Political turmoil.

INTRODUCTION

The distribution of bonobos (*Pan paniscus*) is restricted to the Democratic Republic of the Congo (DRC: Fig. 1). Investigations of the ecology, social behavior, and social structure of wild bonobos in Wamba Forest began in 1973 (Kano, 1984a, 1992; Kano et al., 1994). In 1990, the Luo Scientific Reserve was established around Wamba Forest to protect bonobos and their habitat (Idani, 1990a; Kano et al., 1994).

However, research on bonobos was interrupted by repeated political turmoil in DRC (Kano et al., 1994; Furuichi, 2004). In 1991, a riot in the capital city Kinshasa brought our research to a halt. We resumed research in 1994. However, the first civil war broke out at the end of 1996, and we were forced to halt the research again. Both the government and rebel soldiers passed through Wamba Village and plundered the village repeatedly. In 1998, the second civil war broke out, and government troops were stationed in Wamba Village. The soldiers stayed at our research camp, and the villagers of Wamba

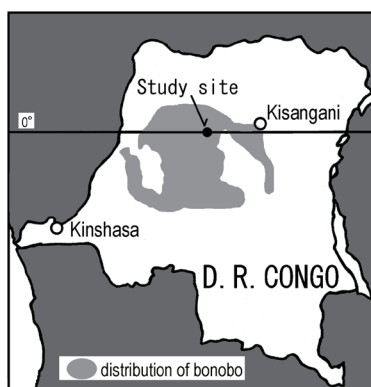


Fig. 1. Study site and distribution of bonobos.

were exploited. After a long absence, we resumed research on bonobos in 2002 (Furuichi & Mwanza, 2003).

In this study we investigate the effect of the political turmoil on the bonobo population and elucidate the cause of the bonobo population change in Wamba Forest.

STUDY AREA AND METHODS

The study site was the Luo Scientific Reserve, Wamba Forest ($0^{\circ}90' \text{ N}$, $22^{\circ}34' \text{ E}$), DRC (Fig. 1). This forest is located about 950 km east-northeast of Kinshasa. Hunting primates, clearing of the primary forest, and hunting with guns, poison arrows, and wire snares are all prohibited in the Reserve (Idani, 1990a; Kano et al., 1996). Five hamlets along a north-south road comprise the village of Wamba. Our base camp was located in Yayenge, the hamlet at the southern end of Wamba Village (Fig. 2).

The Bongando people, who live in the Wamba area, are classified as Bantu farmers, although fishing, hunting, and gathering are also important daily activities (Kimura, 1992). The Wamba Forest vegetation can be classified into dry primary forest with no specific dominant species, swamp forest, secondary forest, and field (Kano & Mulavwa, 1984).

From 15 February to 8 July 1995, we investigated the home ranges of the bonobos that inhabited Wamba Forest. We recorded observation points on a map, based on data from Idani (1990b), and estimated the home ranges of each group. From 19 January to 27 February 2005, we investigated the home ranges of bonobos through direct observation. We also collected information from co-researchers and local assistants concerning the home ranges of each group from September 2003 to the end of 2004.

We collected data on human activities such as hunting and farming in the forest. In addition, to compare the vegetation before and after the civil wars, we analyzed Landsat images taken on 14 January 1990 and 8 April 2003 using ERDAS IMAGINE version 8.6 software. A red-green-blue (RGB) image was synthesized by combining bands 5, 4, and 3.

In January 2006, we conducted a census in the hamlet of Yalisanga in the village of Iyondje neighboring Wamba, to investigate the movements of the local population. The hamlet of Yalisanga is located 30 km east of Yayenge base camp.

RESULTS

Changes in bonobo home ranges and missing bonobo groups

In 1995, six groups of bonobos had inhabited Wamba Forest (Fig. 2a). The home ranges of each group seemed to have been stable since the 1970s, when research on the bonobos in Wamba Forest had first begun. The E1, E2, and P groups were observed directly. These groups were habituated to research-

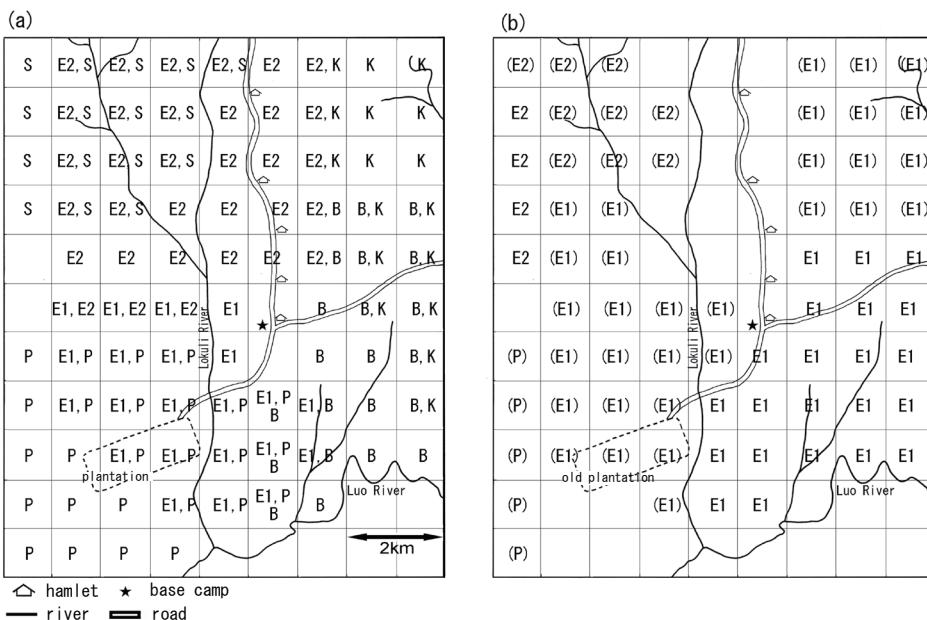


Fig. 2. Change in home range area for each bonobo group in Wamba Forest.

One grid square represents 1 × 1 km. Each letter signifies the group (E1, E2, P, B, K, S).

(a) Home range area of six groups in 1995. (b) Home range area of three groups in 2005. Home range data in parentheses are based on information from co-researchers and research assistants.

ers, and most of the individuals were identified. The B and K groups were also observed directly, although the members of these two groups were not identified. The range of S group was estimated from observations by research assistants and field signs such as footprints and food remains, which were found during the absence of the E2 group from those areas. The home ranges of each group overlapped, and encounters between groups were observed frequently.

In 2005, we observed the E1 and E2 groups directly. The E1 group, which was the main study group, was investigated continuously from September 2003 by Congolese co-researchers. We observed 22 individuals, including two pregnant females, in February 2005. Fourteen of these individuals were the E1 members, consisting of individuals identified in 1995 and young females that had immigrated and their offspring. We could not confirm whether the other eight individuals were original members of the E1 group. Some of them may be adult males recorded as juveniles in 1995 that had grown up. It is possible that we observed group encounter event during our study. Currently, we are investigating the DNA of these bonobos to confirm the identity of the adult males and determine whether they were original members of the E1 group.

During the 2005 study period, the E1 group ranged mainly in the swamp forest in the southeastern part of Wamba Forest to eat the fruit of *Uapaca heudelotii*. Less frequently, this group also consumed the fruit of *Diarium zenkeri* in the dry primary forest, as well as the pith of *Aframomum* spp. and the fruit of *Musanga cecropioides* in secondary forest. The E1 group did not use the west side of the main road where it had used frequently before the civil wars. Combining past and present observations, the E1 group had enlarged its home range markedly to the east and north of its previous home range (Fig. 2b).

In 1995, the E2 group, which consisted of 39 members, used the central part of Wamba Forest and sometimes crossed the main road (Fig. 2a). In 2005, its home range had shifted toward the west, where human activity was rare. This group did not use the east bank of the Lokuli River (Fig. 2b). During our observations, we confirmed the presence of several previously identified individuals, but most individuals including the identified ones were afraid of humans and fled from us. Thus we could not confirm the current group size and composition.

In the southwestern part of Wamba Forest, where the E1 and P groups had ranged in 1995, we found evidence of feeding on *Haumania liebrechtsiana*, *Dalbergia lacteal*, and *Pancorvia laurentii* in 2005. We also found fresh traces of a branch that had been dragged by bonobos. This evidence of bonobo presence was thought to have been left by the P group because the E1 group was in a different part of the forest at that time. Research assistants indicated that the P group was afraid of humans and had shifted its home range westward.

We found no direct or indirect evidence to indicate the survival of the S, K, or B groups. Research assistants and co-researchers have not confirmed the presence of these groups since the civil wars.

Expansion of fields and decrease in primary forest

We analyzed Landsat images to determine the distribution of vegetation types in Wamba Forest. Dry primary forest, swamp forest, and secondary forest or field were easily distinguishable by color (Hashimoto et al., 1998; Kimura, 1998). New fields were created between 1990 (before the civil wars) and 2003 (after the civil wars). The primary forest bordering secondary forest in 1990 had been converted into fields in 2003, and some new fields were located within the primary forest (Fig. 3).

We directly observed the size and number of fields where villagers daily-farmed in 2005 in Yayenge and Yasongo, in the southern part of Wamba Village. Yayenge encompassed 91 fields (107 ha), 84 of which (98 ha) were created by clearing the secondary forest, and seven (9 ha) were created in the primary forest. Yasongo had 131 fields (138 ha), 117 of which (129 ha) were created in the secondary forest, and 14 (9 ha) were created in the primary forest.

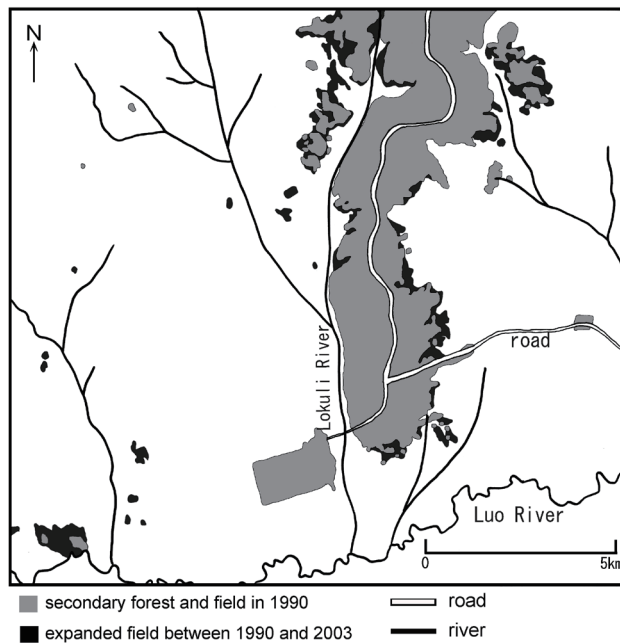


Fig. 3. Expansion of fields and the secondary forest in Wamba Forest determined from Landsat image analysis.

Changes in the composition of human inhabitants

We compared the composition of the local human population before and after the civil wars. The percentages of men in their 20s, 30s, and 40s at Iyondje in 1988 were 20, 12, and 7%, respectively (Kimura, 1992). In Yalisanga in 2006 the percentages were 13, 7, and 8%, respectively. These data indicate that the number of available workers decreased after the civil wars. This change occurred because many men migrated to Kinshasa or Kisangani to obtain cash income instead of remaining in the village. No population data were available for Wamba Village to make comparisons before and after the civil wars, but the situation regarding the emigration of youth from the village was similar.

DISCUSSION

Historically, eating bonobo has been taboo for the people of Wamba (Kano, 1992; Kano et al., 1996), and bonobos were abundant in Wamba Forest. However, repeated political turmoil has made the situation of the bonobos in Wamba Forest worse.

During the civil wars, many soldiers passed through and stayed around Wamba Village, and the villagers were plundered repeatedly and subjected to violence. These soldiers carried guns, and a young male bonobo from the E1 group was shot for food (Furuichi, 2004). However, it is possible that the villagers, who expected us to resume research, did not intend to poach the E1 group, and the number of individuals in the E1 group did not decrease remarkably (Furuichi, 2004). The villagers indicated that soldiers also hunted other groups of bonobo for food, including the P group. Although hunting with guns is prohibited in the Luo Reserve, we heard gunshots in the forest during the 2005 study period. We do not know how many bonobo were poached. However, judging from the readily apparent fear toward humans exhibited by the E2 and P groups, poaching may be one of the leading causes of the population decline among the bonobo in Wamba Forest.

The use of wire snares is prohibited in the Luo Reserve, but snares for hunting animals were seen to have increased in the forest. This may partially be due to the repeated plunder of domestic animals for food by intruders. Villagers who lost their domestic animals in such a way may have increased the use of snares to catch wild animals. Although villagers do not intend to catch a bonobo, they might suffer fatal injuries once they are mistakenly caught in wire snares (Kano, 1984b).

The civil wars destroyed the transportation system, and have caused a great deal of damage to the village economy. Before the wars, the villagers planted coffee and sold it to merchants. However, the coffee trade is no longer active because the transport system has collapsed and merchants left the region. The villagers are suffering from a lack of cash income, and postwar poverty has accelerated the felling of the primary forest. Although felling trees in the pri-

mary forest is also prohibited in the Luo Reserve, slash-and-burn agriculture is expanding rapidly in the primary forest (Fig. 3). Many people believe that crops grow better in fields in the primary forest than in the secondary forest. Moreover, if a villager creates a field in the primary forest, that individual can traditionally own the area for eternity. Villagers are willing to possess land as a substitute for cash income.

The distinct change in the home range of the E2 group may have been caused by human activities around the village. The group now avoids people and remains in the forest. During the wars, many villagers escaped into the forest to avoid the soldiers and constructed temporary residences there. The bonobo may have been displaced from their original home range to areas where human activities were infrequent. Moreover, the habitat conditions for the bonobos seem to be very poor near the village. Bonobos occasionally use resources in the secondary forest, but fruits from the primary forest are their primary food resource (Kano & Mulavwa, 1984; Hashimoto et al., 1998). The decrease in the area of the primary forest around the village may be one reason for the significant changes in the bonobo home ranges.

The present results show that the bonobo density in Wamba Forest decreased markedly during and after the civil wars. We observed only the E1 group and several individuals from the E2 group, directly. The home range areas of bonobo groups change in relation to those of other groups (Kano, 1982; Idani, 1990b; Hashimoto et al., 1998). Therefore, it is possible that the change in the home range area of the E1 group affected those of the other surrounding groups. Thus, we cannot deny the possibility that the S, K, and B groups still exist in the remote forests of Wamba. However, these three groups previously comprised more individuals than the E1 group, which would probably have made it difficult for the E1 group to drive out the other groups to another forest area. It is more likely that poaching or other human activities decimated some groups, and the E1 group then expanded its range into the unoccupied forest.

Most people in DRC are accustomed to eating bonobo. Although the local villagers do not eat bonobo, hunting by people from other areas may have decreased the bonobo population (Cowlshaw & Dunbar, 2000). Moreover, the villagers of Wamba and Iyondje said that the movement of people between towns and villages increased after the civil wars. The frequent movement of people between villages and towns brings new customs to the villages. It is possible that the taboo against eating bonobo will disappear among the people of Wamba in the future. Judging from the situation of the Wamba Forest, the bonobo populations in DRC appear to have declined precipitously, and the prospect for bonobo survival is currently very grave.

ACKNOWLEDGMENTS We are grateful to the Centre de Recherche en Ecologie et Foresterie, République Démocratique du Congo (CREF) for permission to work in the Luo Scientific Reserve. We thank Dr. N. Mwanza and other members of CREF and research assistants of Wamba for their help and information in the field. We thank Dr.

T. Kano who led us to Wamba. We thank Dr. H. Ihobe of Sugiyama Jogakuen University for his assistance and valuable comments. This study was financed by the JSPS Core-to-Core Program HOPE, National Geographic Society, and the Toyota Foundation.

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——— Accepted January 18, 2007

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